WHAT IS CLAIMED IS:

1. An assembly for cleaning a thin, flat substrate comprising:

a transmitter to be positioned above a substantially flat surface of the substrate so that when liquid is applied to a small gap between the transmitter and the substrate, a meniscus of liquid is formed between the transmitter and the substrate; and

a transducer coupled to the transmitter in a manner to create a transmission path for transmitting megasonic vibration from the transducer through the transmitter to the substrate, the transducer being coupled to the transmitter in a manner to attenuate the energy transmitted to a lowermost portion of the transmitter to prevent damage to delicate devices on the substrate that are substantially directly beneath the lowermost portion, while portions of the transmitter adjacent the lowermost portion are not so attenuated.

2. The assembly of Claim 1, including a gap in the transmission path, the gap being aligned with the lowermost portion of the transmitter to attenuate the megasonic energy transmitted to the lowermost portion.

3. The assembly of Claim 1, including a barrier to the transmission of megasonic energy in the transmission path that attenuates the energy transmitted to said lowermost portion.

4. The assembly of Claim 1, wherein said lowermost portion has an elongated configuration forming an edge uniformly spaced from the substrate.

5. The assembly of Claim 1, including a support for the substrate; and

a source of liquid to be applied to the gap between the substrate and the transmitter.

6. The assembly of Claim 5, wherein said source of liquid includes a dispenser for dispensing liquid into said gap.

7. The assembly of Claim 1, wherein said transmitter includes a rear face which is coupled to said transducer, and the rear face is configured so that megasonic energy is not transmitted from the transducer to the transmitter in a portion of said end face so as to attenuate the energy transmitted to said lowermost edge.

8. The assembly of Claim 7, wherein said rear face is generally circular, and said portion comprises a wedge-shaped recess in said end face.

9. The assembly of Claim 1, wherein said transmitter comprises an elongated rod having a generally circular end face, said transducer is coupled to said end face to create said transmission path, said path including a portion in which the transmission of energy from the transducer to the transmitter is attenuated in a manner to produce attenuation of the megasonic energy at said lowermost edge.

10. The assembly of Claim 1, including a heat transfer element positioned between the transducer and the transmitter and forming a portion of said transmission path, said element being configured to attenuate the energy transmitted to a portion of the transmitter.

11. The assembly of Claim 1, including a coupler positioned in the transmission path between the transducer and the transmitter with the coupler being configured to attenuate the energy transmitted to said lowermost portion.

12. The assembly of Claim 11, wherein the coupler is generally elliptical in shape and is configured to produce a pattern of megasonic energy transmission that is other than a radial pattern.

13. An assembly for cleaning a thin flat substrate comprising:

a transmitter including an elongated element with a lower edge to be positioned above but closely adjacent to a flat surface of the substrate;

a transducer for translating electrical energy into megasonic vibration; and

a heat transfer element positioned between the transducer and the transmitter to transmit vibration to the transmitter; wherein

the heat transfer element is configured to attenuate the energy transmitted to a portion of the probe.

14. An assembly for cleaning a thin flat substrate comprising:

a transmitter having a lower edge to be positioned above but closely adjacent to a flat surface of the substrate;

a transducer coupled to the transmitter for translating electrical energy into megasonic vibration; and

wherein a face of the transmitter coupled to the transducer is configured to attenuate the energy transmitted to a portion of the transmitter.

15. A megasonic probe assembly for cleaning a thin flat substrate comprising:

a probe including an elongated rod with a lower edge along the length of the rod to be positioned above but closely adjacent to a flat surface of the substrate;

a transducer for translating electrical energy into megasonic vibration;

a heat transfer element positioned between the transducer and a rear end face of the probe; and

a coupler positioned between the heat transfer element and the rear end face of the probe, the coupler transmitting the megasonic vibration to the rear end of the probe, the coupler being configured to attenuate the energy transmitted to a portion of said probe.

16. The assembly of Claim 15, wherein the coupler is configured to produce a pattern of megasonic energy transmission from the probe other than a radial pattern.

17. The assembly of Claim 15, wherein the coupler is generally disc-shaped, but has a portion aligned with the probe lower edge that is configured to minimize the transmission of megasonic energy to the lower edge.

18. The assembly of Claim 15, wherein a portion of the end face of the probe is spaced from the heat transfer element and the spaced portion is aligned with the probe lower edge so that the transmission of megasonic energy to the probe lower edge is minimized.

19. The assembly of Claim 15, wherein the coupler is generally elliptical, and the coupler is configured to produce a pattern of megasonic energy transmission from the probe other than a radial pattern.

20. A megasonic probe assembly for cleaning a substrate comprising:

a transmitter having a portion spaced from but closely adjacent to a substantially flat surface of the substrate so that when liquid is applied to the transmitter and the substrate, a meniscus of liquid is formed between the transmitter and the substrate; and

a transducer coupled to the transmitter in a manner to create a transmission path so that megasonic vibration from the transducer is transmitted to the transmitter and is transmitted through the meniscus to the substrate as normal-incident waves directly beneath the probe lower edge, and shallow-angle waves on either side of the normal-incident waves, said waves being adapted to loosen particles on the substrate, the transducer being coupled to the transmitter in a manner to reduce a ratio of the normal-incident waves to the shallow-angle waves so as to prevent damage of delicate devices on the substrate beneath said lower edge.

21. A method of cleaning a substrate comprising the steps of:

providing a transmitter made of a material that is a good conductor of megasonic energy;

positioning the transmitter so that a lower edge is positioned spaced from but closely adjacent to a substantially flat surface of the substrate so that when liquid is applied to the edge and the substrate, a meniscus of liquid is formed between the edge and the substrate;

providing a transducer for producing megasonic vibration;

coupling the transducer to the transmitter so that a transmission path is created to transmit the megasonic vibration into the transmitter; and

creating a barrier in the transmission path so that the liquid vibration is attenuated directly beneath the probe lower edge.

22. The method of Claim 21 including the step of creating said barrier by forming a recess in a rear face of the transmitter , with the recess being axially aligned with said transmitter lower edge.

23. The method of Claim 21 including positioning a separate element in said transmission path, and said barrier is formed by creating a gap in said separate element.

24. The method of Claim 21 including positioning a heat transfer element to form part of said transmission path and configuring the heat transfer element to create said barrier; and conducting heat transfer fluid in heat transfer relation with said heat transfer element to conduct heat away from said transducer.